

ENDOCRINE SYSTEM¹

I. INTRODUCTION

A. OUTLINE OF HIGHLIGHTED CONDITIONS

- 1) Diabetes Mellitus
- 2) Parathyroid Disorders
- 3) Thyroid Disorders
- 4) Adrenal Disorders

B. IMPLICATIONS FOR JOB PERFORMANCE

The patrol officer position includes a variety of physically and emotionally demanding job duties that require proper endocrine function, such as:

- Running distances up to 500 yards at full speed;
- Subduing combative subjects after pursuit running;
- Immediate responses to life threatening situations;
- Prolonged surveillance and requirements for heightened vigilance;
- Visually demanding job situations such as high speed pursuit driving, firing weapons, clocking the speed of vehicles, and the identification and detection of evidence and suspects.

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II. MEDICAL EXAMINATION AND EVALUATION GUIDELINES

A. GENERAL SCREENING RECOMMENDATIONS

- 1) **History:** See Medical History Statement.
- 2) **Examination:** The physical exam should include evaluation of the head, eyes, neck, skin and nail beds for evidence of endocrine dysfunction.
- 3) **Routine Tests:** A chemistry panel measuring calcium, phosphorous and glucose should be performed. Urinalysis is required to check for sugar, ketones and protein.

B. EVALUATION OF COMMON CLINICAL SYNDROMES

1) DIABETES MELLITUS

a. GENERAL CONSIDERATIONS:

Classification:

Recent changes have been proposed in the classification and terminology used to describe diabetes (Abourizk & Dunn, 1990). For the purpose of work capacity evaluation, persons with insulin-dependent diabetes mellitus (IDDM) are those who must use insulin to control their blood glucose, with small changes in insulin possibly resulting in dramatic changes in control. Persons with non insulin-dependent diabetes mellitus (NIDDM) are those who do not absolutely require insulin, but at times may benefit from its use (Abourizk & Dunn, 1990).

Control:

Blood glucose level depends on a number of factors, such as food intake, stress, activity and medication. Individuals with NIDDM can sometimes control blood sugar by diet modification alone. When this is not effective, oral medication and/or insulin can be used in addition to diet. Activity is encouraged as an adjunct to diet and/or drug therapy to improve glycemic control, reduce cardiovascular risk factors and improve well-being (American Diabetes Association, 1991).

Insulin regimens may involve conventional treatment with morning and evening injections of insulin, or intensive treatment with multiple doses of insulin each day, and frequent monitoring of blood sugar to determine the amount of

insulin required at the next injection. These types of treatments involve taking a baseline amount of intermediate acting insulin and smaller amounts of shorter acting regular insulin. Insulin can also be used as an adjunct to treatment with oral agents for improved blood glucose control.

Regardless of the regimen used, if too much insulin is injected, or if too much oral agent is taken, blood sugar may fall below normal, resulting in hypoglycemia. Hypoglycemia can cause cognitive impairment, which may progress to confusion and coma. When insufficient insulin is injected, blood sugar levels exceed normal which may result in diabetic damage to the eyes, kidneys, nervous system and blood vessels. Hyperglycemia can also be associated with depression, urinary urgency, cognitive changes and fluctuating visual acuity (American Diabetes Association, 1996).

Several large cooperative studies have investigated the need to meticulously control blood sugar to delay the onset of end organ damage from diabetes (DCCT Research Group, 1987, 1990, 1991; Krog, 1984). However, the risk of hypoglycemia increases as meticulous control is approached, which may limit the ability of some individuals to maintain adequate control (DCCT Research Group, 1991). Maintaining adequate control may also be more difficult for individuals who have nearly normal glycosylated hemoglobin, due to CNS tolerance to hypoglycemia that serves to reduce the responses of counter regulatory hormones and can result in unawareness of hypoglycemia (Boyle, et al., 1995).

Blood glucose control is affected by diet, medication, and activity. Most individuals with diabetes follow a prescribed diabetic diet. Typically, daily calories are divided into three meals, with one or two small snacks. Regularity of food intake is important. If more calories are eaten, then more activity and/or more insulin is needed. If fewer calories are eaten, less activity and/or medication is needed. Insulin should be injected at least 30 minutes prior to eating (American Diabetes Association, 1991). The site of the injection can be rotated; however, the rate of absorption of insulin and its effect may depend on the site of injection.

Activity should be planned. Vigorous activity, such as running 100 yards, enhances glucose utilization because muscle uptake of glucose increases 7-20 times over baseline during physical exertion. Enhanced glucose utilization may continue for several hours after activity ceases and evening exercise may cause nocturnal hypoglycemia (American Diabetes Association, 1991). When activity is unplanned or cannot be anticipated, glucose regulation becomes very complex.

There are counter regulatory mechanisms in the body to prevent hypoglycemia; however, these can be compromised in persons with diabetes. When blood sugar falls, the body normally shuts off insulin secretion and releases the hormone glucagon which enhances liver production of sugar. However, an individual with IDDM cannot shut off insulin secretion and must instead rely on glucose intake or hepatic glucose production to maintain serum glucose levels. Up to 24 hours is required to replenish liver carbohydrate stores once they have been exhausted. A second bout of strenuous activity during this period of time would significantly increase the risk of hypoglycemia.

Hypoglycemia also causes epinephrine release, which promotes a counter regulatory response. Cognitive dysfunction and personality change may occur prior to epinephrine release and therefore may not be recognized by the individual. Unfortunately, IDDM individuals often become under-responsive or non-responsive to the hypoglycemic stimulus. This leads to a diminished ability to identify a hypoglycemic situation, and increases the risk of a severe reaction and coma (Amiel, et al., 1988).

Several studies have shown that severe hypoglycemia reactions are common (Table III-1) and that mild and moderate insulin reactions occur in almost all IDDM individuals. Hypoglycemic reactions also occur in NIDDM individuals on oral medication. The unplanned and emergency nature of the patrol officer position compounds the difficulty of diabetic control.

There are a variety of job demands and realities of police work that can limit the ability to control one's diet, activity, and medication, thereby increasing one's susceptibility to hypoglycemic reactions. Examples include:

- inability to always control mealtimes and diet;
- changing and protracted work shifts;
- varying, unpredictable degrees of physical activity;
- wide-ranging, often high degrees of physical and psychological stress.

In addition, time-critical emergency situations encountered in police work can be at odds with the time interval required for blood testing, medication (e.g., insulin injections) or for food supplements to take effect in averting a diabetic reaction. For example, the risk of hypoglycemia is obvious for an IDDM officer who has been sedentary the first half of his/her work shift, injects insulin 30 minutes prior to lunch, and then is called to an emergency that requires his/her full attention prior to eating lunch.

TABLE III-1

Studies of the Incidence of Hypoglycemia in Persons with Diabetes

Author, Year	Study Population	Definition of Hypoglycemia	Incidence of Hypoglycemia
Arias, et al., 1985	19 IDDM patients: 10 CSII, 9 intensified conventional tx 24-hour continuous blood glucose monitoring	Hypoglycemia: blood glucose \leq 50 mg/dl for at least 3 minutes	9/10 CSII and 5/9 ICT patients with hypoglycemic episodes 25% of episodes detected by CSII patients 75% of episodes detected by ICT patients
Basdevant, et al., 1982	147 IDDM patients; 64 f/u by GP, 83 f/u by diabetic unit 91% of hospital group take 2 or 3 insulin injections/d 42% of GP group take 1 insulin injection/d	Severe hypoglycemia (broad defn): coma, need for glucagon injection, emergency hospitalization or need for assistance	31% of hospital group \geq 1 episode of severe hypoglycemia in past year 27% of GP group \geq 1 episode of severe hypoglycemia in past year
Bielefeldt & Reis, 1990	Type II diabetes patients: 55 insulin-treated and 83 oral agent treated	Severe hypoglycemia (narrow defn): loss of consciousness or need for injections of glucose	16% of insulin-treated and 1.2% of oral agent-treated had severe hypoglycemia during a 1-year period
Casparie & Elving, 1985	400 insulin-treated diabetes patients (50% with Type I)	Severe hypoglycemia (narrow defn): need for another person to inject glucagon or glucose, or hospital admission	8.5% of IDDM patients and 4.5% of non-IDDM patients had severe hypoglycemia during a 1-year period
Clarke, et al., 1980	157 Type I patients	Hypoglycemia: symptoms	38% of patients had experienced hypoglycemia while driving (time period not specified)
DCCT Research Group, 1987	132 Type I patients on experimental regimen 146 Type I patients on standard treatment	Severe hypoglycemia (narrow defn): seizure, coma, hospitalization, or need for intravenous glucose or glucagon	26 and 9.8% of experimental and standard groups, respectively, had severe hypoglycemia during 1-year period
DCCT Research Group, 1991	817 IDDM patients: 424 experimental intensive tx patients (i.e., \geq 3 daily insulin injections/d), 393 standard patients who had \geq 2 hypoglycemic seizures/coma in past 2 years, \geq 1 episode of neurologic impairment without warning sx of hypoglycemia were excluded from the study	Severe hypoglycemia = event consistent with hypoglycemia requiring another person's assistance and assoc with a BS $<$ 50 mg/dl, or prompt recovery after oral CHO, IV glucose or glucagon administration	26% reported severe hypoglycemia episode (77% from expt group) 43% of severe hypoglycemia episodes occurred 1200-0800. For severe hypoglycemia episodes during waking hours, 36% could not recall warning sx (37% in expt group, 31% in std group) Summary: in the expt group, incidence of severe hypoglycemia ranged from 2-6 times that observed with the conventional group 6.5% all DM patients \geq 1 severe hypoglycemia (8% patient-year incidence) 22% with cause unknown for severe hypoglycemia (all Type I patients)
DCCT Research Group, 1995	1441 IDDM patients: followed for average of 6.5 years Intensive treatment group compared with standard treatment group	Severe hypoglycemia: as above in DCCT 1987	Major risk of intensive treatment is a three-fold increase in risk of severe hypoglycemia

Frier, et al., 1980	250 Type I patients	Significant hypoglycemia (broad defn): coma, severe or frequent moderate hypoglycemic reactions	34% had severe or frequent hypoglycemia during a 6-month period
Goldewicht, et al., 1983	172 Type I patients	Severe = all insulin reactions that result in hospitalization or need external help. All other reactions = "Mild"	58% \geq 1 mild episode/month 26% \geq 1 severe episode in past year 42% \geq 1 severe episode in past 5 years 11% of subjects without explanation for episodes 3% never aware of any hypoglycemic symptoms 14% reported emotional factors as a cause
MacLeod, et al., 1983	600 Type I IDDM patients 75.7% using conventional insulin tx	Severe hypoglycemia = episode which required the assistance of another person to promote recovery	29% with severe hypoglycemic episode in past year (1.6 episodes/patient/year) 25% Type II patients with severe hypoglycemic episode (0.73 episodes/patient/year) Removal of Type II patients gives an incidence for Type I patients for severe hypoglycemia = 29.6% or 1.7 episodes/patient/year
Muhlhauser, et al., 1985	434 IDDM patients (50 on CSII)	Severe hypoglycemia = Loss of consciousness followed by administration of glucagon by relatives, friends, assistance by MD or hospitalization	384 conventionally tx patients with 10% incidence of severe hypoglycemia 50 CSII patients with 9% incidence of severe hypoglycemia
Nilsson, et al., 1988	46 patients admitted to ER in 1-year period for severe hypoglycemia	Severe hypoglycemia = an episode of hypoglycemia demanding parenteral tx promptly resolving the sx's	7% patient-year incidence 78% admitting to \geq 1 severe hypoglycemia in past year 5.1% could not ID the cause for severe hypoglycemia 27% ID decreased food intake as cause 25% ID increased physical activity as cause
Pramming, et al., 1991	411 Type I IDDM patients 78% take 2 insulin injections/d (mixture of regular and intermediate) 12% take 3 injections/d	"Mild" = episode requiring immediate intake of glucose or food, managed by the patient Severe hypoglycemia = episode in which patient is unable to take action by himself and is dependent on help from others	Mild hypoglycemia = 1.8 episodes/patient/week Severe hypoglycemia = 0.027 episodes/patient/week 27% with severe hypoglycemia and without warning sx's 73% stated that sx's became weaker with time
Ward, et al., 1990	158 IDDM patients 78% with conventional insulin therapy 22% with intensive insulin therapy (\geq 3 injections/d)	Severe hypoglycemia = episodes requiring assistance from someone else, incl hospitalization or LOC with spontaneous recovery All other episodes defined as "Mild"	17% with severe hypoglycemia in past year (7% $>$ 5 in past year) Mild hypoglycemia common: 73% reporting mild hypos at least monthly and 15% most days 5% without warning symptoms on a regular basis 48% with warning symptoms before every episode

Reproduced in part from Williams, A. 1991. Table 1: Studies of the incidence of hypoglycemia in persons with diabetes. Comments on Qualifications of Drivers. Diabetes. FHWa Doc. No. MC-87-17, with permission.

b. RECOMMENDED EVALUATION PROTOCOL:

History:

All candidates should be questioned regarding the onset of diabetes, history of ketoacidosis, medication(s), diet, and activity regimen followed to maintain blood glucose levels. The circumstances and outcomes surrounding all episodes of hypoglycemia in the last 5 years should be obtained. A blood glucose diary should be kept and reviewed, along with the results of lab testing performed in the past, to determine level of glucose control. History of complications from diabetes and symptoms such as early satiety, bloating and paresthesia should be fully evaluated. The results of any special testing, such as c-peptide values or islet cell antibody testing, should be considered.

Examination:

Eyes: All candidates with diabetes mellitus should have a complete eye examination by an ophthalmologist, documenting the absence of clinically significant eye disease. The eye examination should assess visual acuity, ocular tensions, and presence of lenticular opacities, and include careful examination of the retina for evidence of any diabetic retinopathy or macular edema. Color vision testing² for these candidates should include use of the Farnsworth D-15 or other test which specifically assesses the presence of blue-yellow color vision deficiency, in addition to any pseudochromatic plate test that primarily assesses red-green deficiency (e.g., Ishihara).

Neurological and Cardiovascular: Neurosensory function testing with a tuning fork, light touch and nylon monofilament³ should rule out significant sensory neuropathy. Check for vascular insufficiency, bruits, and dependent extremity color changes. Orthostatic blood pressure changes may relate to autonomic dysfunction.

Routine Testing:

Proteinuria should be evaluated with a 24-hour creatinine clearance and protein determination. Hemoglobin A-1C should be measured. Values more than 4 standard deviations above the mean are an indication of poorly controlled diabetes.

²Color vision screening guidelines can be found in Section XI-6 of this manual.

³See Caputo, G.M, Cavanagh, P.R., et al., Assessment and Management of Foot Disease in Patients with Diabetes, NEJM Sept. 29, 1994; 331: 854-860 for a description the monofilament testing process.

GROUP I: INDIVIDUALS WITH NIDDM WHO DO NOT TAKE INSULIN

Level 1: Diabetes controlled by diet alone:

No work restrictions are necessary.

The presence of microaneurysm, exudates, or other findings of background retinopathy during the eye examination is not, in and of itself, sufficient grounds for disqualification unless visual acuity is affected and prevents the candidate from meeting current agency vision standards. However, **individuals with active proliferative retinopathy, vitreous hemorrhages or macular edema of pre-proliferative retinopathy should not be medically cleared until the condition has stabilized.**

If hemoglobin A-1C levels are found to be abnormal, the candidate should be deferred until evaluation, treatment, and control of diabetes can be documented for at least 6 months. (Note: Candidate's status may change to Level 2 or Group II.)

Level 2: Diabetes controlled by diet and oral medication:

Blood glucose levels should be monitored and documented 4 times per day (before breakfast and one hour after each meal) for a minimum of 3 times per week for at least three months, using a One-Touch II blood glucose monitoring device or testing device that is equally efficient with memory and printout capability. The candidate must agree to maintain testing at least 1 time per week during employment. If test results are satisfactory and the candidate agrees to ongoing testing, the candidate can be cleared for patrol officer duties.

The presence of microaneurysm, exudates, or other findings of background retinopathy during the eye examination is not, in and of itself, sufficient grounds for disqualification unless visual acuity is affected and prevents the candidate from meeting current agency vision standards. However, **individuals with active proliferative retinopathy, vitreous hemorrhages or macular edema of pre-proliferative retinopathy should not be medically cleared until the condition has stabilized.**

If hemoglobin A-1C levels are found to be abnormal, the candidate should be deferred until evaluation, treatment and control of diabetes can be documented for at least 6 months.

Candidates who either have experienced serious episodes of hypoglycemia (i.e., requiring the assistance of others), within approximately the past five years, or who present indications of

autonomic dysfunction can be considered to constitute a "direct threat" if positioned as a patrol officer, and therefore should be disqualified from further consideration. (Note: A recent study (DeFronzo, et al., 1995) of IDDM individuals found that the incidence of symptoms compatible with hypoglycemia was 2% for those who took metformin alone, 3% for those who took only glyburide, and 18% for those given both metformin and glyburide in combination.)

GROUP II: INDIVIDUALS WITH IDDM AND THOSE TAKING INSULIN

It is imperative that individuals with IDDM keep their blood glucose levels in the normal range to limit the long term consequences of the disease. However, incidence of hypoglycemia may be made considerably more frequent by the significant and often unpredictable physical and mental job demands associated with the patrol officer position. As a result, the need for tight control can often be incompatible with these unpredictable, strenuous job demands. Therefore, given the consequences of poor or failed job performance on public health and safety, officers who use insulin can pose a direct threat unless they can demonstrate considerable experience and the ability to control their blood glucose levels even under adverse circumstances.

Any individuals with diabetes who require insulin are at a significant risk for hypoglycemic episodes (see Table III-1). Therefore, the screening protocol described below applies to individuals with IDDM *as well as those with NIDDM who take insulin to control their diabetes.*

Phase I - Initial Screening

A. Review of Medical Status/History: All candidates should supply the following information to ensure that they can maintain adequate blood sugar control in even unpredictable, emergency situations:

✓ Medical records documenting medical care over the past five years. The insulin requirements of individuals with newly-diagnosed IDDM may dramatically change for up to 18-24 months after diagnosis. Therefore, although these individuals do not have a five-year history of IDDM to review, they should be observed over a period sufficient to eliminate unrealistic expectations of easy control.

✓ Verification from candidate's physician that there have been no serious episodes of hypoglycemia over the past five years⁴ (i.e., episodes requiring the assistance of others). The physician should also be questioned regarding the existence of other indication(s) of problems or poor control that may not have been reflected in the written history. The physician may also be asked to approve the candidate to perform any agency-specific job demands, such as working swing shifts, night shifts, or being on-call for extended (e.g., 24 hour) time periods.

✓ Medical records should also indicate that the candidate is free of any autonomic dysfunction (i.e., normal neurologic exam results, normal R-R variation on EKG with valsalva; any indication of significant sensory neuropathy based on sensory testing using nylon monofilament⁵ should be carefully evaluated). If this information is not available from records, the applicant will need to obtain this information by referral from his/her treating physician.

Candidates who have experienced any serious hypoglycemic episodes (i.e., requiring the assistance of others) within approximately the past five years, or who present indications of autonomic dysfunction can be considered to constitute a "direct threat" if positioned as a patrol officer, and therefore should be disqualified from further consideration.

B. Vision Testing.

✓ A vision examination by an ophthalmologist documenting the absence of clinically significant eye disease should be required of all candidates. Examination and evaluation procedures are the same as those discussed for individuals with NIDDM who do not take insulin (see Group I, Levels 1 and 2). As discussed in those sections, the presence of microaneurysm, exudates, or other findings of background retinopathy, by themselves, are not sufficient grounds for disqualification unless visual acuity is affected and prevents the candidate from meeting current agency vision standards. However, individuals with active proliferative retinopathy, vitreous hemorrhages or macular edema of pre-proliferative retinopathy should not be medically cleared until the condition has stabilized.

⁴Or throughout the course of the individual's history of IDDM, for those who have been diagnosed with the condition for less than five years.

⁵See Caputo, G.M, Cavanagh, P.R., et al., Assessment and Management of Foot Disease in Patients with Diabetes, *NEJM* Sept. 29, 1994; 331: 854-860 for a description the monofilament testing process.

✓ Significantly higher incidence of blue-yellow color vision deficiency have been found in IDDM individuals (Hardy, et al., 1992; Utku & Atmaca, 1992). Therefore, color vision testing⁶ for these candidates should include use of the Farnsworth D-15 or other test which specifically assesses the presence of blue-yellow color vision deficiency, in addition to any pseudochromatic plate test that primarily assesses red-green deficiency (e.g., Ishihara).

Phase II - Blood Glucose Control

✓ Candidates who successfully complete Phase I should maintain continuous diary listings of their blood glucose levels for a period of at least six months.⁷ Blood glucose levels should be measured by a One-Touch II blood glucose device or another testing device with equivalent efficiency, memory, and printout capability. Blood sugar levels should be determined frequently during this time (4 times per day--before each meal and at bedtime--and as needed). In addition to blood glucose measurements, candidates should also record other relevant information, such as medications taken, dietary intake out of the ordinary, descriptions of the type and amount of activity, as well as any unusual conditions affecting blood glucose control.

Only candidates whose diaries indicate adequate blood glucose compliance and control--defined as maintaining blood glucose levels between 100-300, with no instances of serious hypoglycemia or other behavioral/cognitive impairment--should continue on in the medical evaluation process.

Note: Candidates who use an insulin pump should be outfitted with a departmental uniform, including all required equipment (e.g., belts, bullet-proof shield, etc.) to ensure that the pump's effectiveness is not compromised. However, any problems encountered will likely lead to relocation of the entrance point on the body, or a change in equipment, rather than in summary disqualification.

Phase III - Insulin Infusion Testing

✓ Insulin infusion testing is an effective means of assessing the candidate's behavioral response to hypoglycemia. The insulin infusion test should only be conducted at a university or specialty

⁶Color vision screening guidelines can be found in Section XI-6 of this manual.

⁷Retrospective diaries that meet the criteria stipulated here may be accepted in lieu of prospective record-keeping.

laboratory by an endocrinologist experienced with this testing procedure. The testing should be conducted using an accepted protocol, such as described in Table III-2. Assessments of cognitive functioning and related physical symptoms, as well as awareness of one's blood glucose level, should be conducted when blood glucose level descends below 100. Table III-3 provides behavioral assessment criteria for use during testing. The specific blood level corresponding to onset of impairment should also be noted, as well as the candidate's glucagon and epinephrine response to hypoglycemia.

Only candidates whose test results indicate a normal glucose response and an appropriate epinephrine secretory response⁸ and no evidence of cognitive impairment when glucose is above 60 should continue in the medical evaluation process.

TABLE III-2
Insulin Infusion Test Protocol

The following protocol is adapted from White, N.H., et al., "Identification of Type I Diabetic Patients at Increased Risk for Hypoglycemia during Intensive Therapy," *New England Journal of Medicine*, March 3, 1983, Vol. 308, No. 9, pp. 485-491.

The test should be conducted after an overnight fast and with the candidate in a supine position throughout. Candidates should not receive any intermediate-acting insulin for at least 24 hours and no short-acting subcutaneous insulin for at least 12 hours before the test. Insulin infusion levels should begin at 40 mU per kilogram of body weight per hour and should continue for 100 minutes. Human regular insulin should be diluted in 0.9% saline to a concentration appropriate for the particular infusion rate (8-12 ml per hour). Blood samples should be removed through an indwelling intravenous line at -20, -10, and 0 minutes and at 10-minute intervals during the insulin infusion test and until test conclusion. Testing should continue for 180 minutes. All specimens should be tested for glucose. The specimens at 0 minutes and 180 minutes should be tested for epinephrine and glucagon. Symptoms reported during testing and the results of glucose testing should be used to define which specimens require additional testing.

⁸If glucose response is normal, measurement of epinephrine is not necessary.

TABLE III-3

Assessment of Cognitive and Behavioral Functioning During Insulin Infusion Testing

Directions: The following questions are for use in documenting candidates' cognitive and behavioral reactions during the insulin infusion test.

Indicate the candidate's BG level when s/he began to experience each of the following symptoms, and whether the candidate was aware that s/he was experiencing these reactions:

		BG Level	Self Aware? (Y/N)
1.	Coordination Problems (for example, have candidate thread a needle, write his/her name, flip a coin, walk a straight line, or do jumping jacks).	_____	_____
2.	Cognitive Impairment (for example, have candidate perform simple arithmetic or related task).	_____	_____
3.	Visual Disturbances (for example, have the candidate read something at close proximity and at a distance).	_____	_____
4.	Trembling, sweating, light-headedness, and/or other related symptoms. Describe: _____ _____	_____	_____

Phase IV - Job Related Testing.

✓ In order to ensure that the individual is able to withstand the physical and psychological demands of the patrol officer job, the candidate should participate in a **job related test** conducted by the agency's screening physician or agent. This test can be conducted during one 8-hour time period, or it may be administered over several days to better simulate the specific working conditions faced at that agency (e.g., shift work) or to assess the candidate under a greater variety of situations (e.g., interruption of meal on one day but not others).

The candidate should be informed that the test will involve being asked to run on a treadmill for seven minutes (two minutes to accelerate pulse and five minutes of exercising at a pulse of between 75%-90% x 220 - age) at random intervals throughout the day. No forewarning and no time to ingest any substance during the seven minutes of running is provided. After the run,

the candidate will be required to walk for 25-30 minutes, during which time s/he is allowed to ingest lifesavers or other substance as desired, that an officer could be expected to easily carry on oneself while on duty.

Candidates should be informed that the purpose of this test is to ensure that they can maintain their blood glucose levels within 100-300 throughout all phases of testing. Candidates should be required to bring their personal reflectance meter and reagent strips (One Touch II or equivalent device), medication and any food desired during the testing period. They should be informed that periodic glucose measurements will be taken by the test administrator and that these readings will be sent to a laboratory for analysis; therefore, it would be prudent to ensure that their personal reflectance meter is properly calibrated.

The candidates' blood glucose levels and visual acuity levels should be measured at the beginning of the test and several times throughout the 8-hour testing process. **Any blood glucose reading that is below 60, or any reading over 350 indicates that the candidate could demonstrate insufficient blood glucose control during critical patrol officer circumstances and events, and is therefore a failed test. Successful completion of this test also requires that the individual's visual acuity remain within agency standards at all times during testing.**

Maintenance Requirements:

If approved for duty, the candidate must agree to remain under an endocrinologist's care, maintaining quarterly scheduled appointments. **Regular**, ongoing blood glucose monitoring should involve, at a minimum, use of a One-Touch II or equivalent device within 1/2 hour prior to assuming work duties, and approximately every 2 hours while on **pay status**. Blood glucose levels outside of the 100-300 range requires notification of one's supervisor and cessation of all work duties that have public health and safety implications.

In order to formalize their obligation to comply with these maintenance procedures, it is recommended that candidates sign a pre-placement agreement. A sample pre-placement agreement for IDDM candidates can be found in Figure III-1).

Testing should be conducted for signs of the onset of autonomic neuropathy prior to the end of the probationary period, at five year intervals thereafter for officers who have had diabetes for ten years or less, and at 2 year intervals for those who have had over ten years of experience with the condition.

FIGURE III-1

Sample Pre-Placement Agreement for Patrol Officers Using Insulin

SAMPLE

PRE-EMPLOYMENT NOTICE OF REASONABLE ACCOMMODATION REQUIREMENTS

Name: _____ **Date of Hire:** _____

Medical Condition: Diabetes treated with insulin.

I acknowledge that the medical condition noted above was present at the time that the (name of law enforcement agency) offered me employment. I affirm that I am currently using insulin for control of diabetes. I understand that my use of insulin is permitted as a reasonable accommodation for my medical condition and that failure to properly maintain my blood sugar is cause for dismissal.

I understand that my ability to safely perform the duties assigned to me as a full-duty patrol officer is contingent upon my ability to successfully maintain my blood sugar between 100-300 at all times, and I shall do so whenever I am on pay status. I will measure my blood glucose using a recording device immediately prior to beginning work and at least every 2 hours while on pay status. When my blood glucose falls outside the range of 100-300, I will notify my supervisor and cease all work duties that have public health and safety implications.

I understand that the repeated inability to maintain my blood glucose between 100-300 may be cause for termination of my employment. I also understand that my condition requires periodic medical testing for autonomic neuropathy, eye disease and other complications of diabetes.

I agree to notify my employer if I develop hypoglycemia that requires assistance while on or off duty.

I agree to provide medical records to my employer on a regular basis.

I agree to allow my employer to review the historical test results stored in my glucometer recording device.

I agree to undergo periodic medical testing to determine whether I have developed damage to my nervous system or eyes.

By my signature below, I acknowledge that I have read and accept the conditions of this Notice.

SIGNATURE _____

DATE _____

Officers should have annual ophthalmological examinations to check for the onset of clinically significant eye disease, color vision deficiency and acuity change as discussed earlier.

Officers who during their tenure as a patrol officer develop IDDM, or who require insulin for control, should be evaluated using this protocol to determine fitness for duty.

2) PARATHYROID DISORDERS

Asymptomatic hypercalcemia is usually caused by primary hyperparathyroidism. Depending on the degree of elevation, excess calcium may cause fatigue, depression, mental confusion, anorexia, nausea, vomiting, constipation, or cardiac arrhythmias. Kidney stones may be associated with hypercalcemia, and the possibility of an underlying malignancy causing hypercalcemia should be considered.

Undiagnosed abnormalities in calcium levels require evaluation, diagnosis, and treatment before medical clearance. Calcium and phosphorous levels should be in an acceptable range based on two testings conducted at least one month apart.

3) HYPER AND HYPOTHYROIDISM

Hyperthyroidism commonly causes nervousness, emotional lability, inability to sleep, tremors, frequent bowel movements, excessive sweating and heat intolerance. Muscle weakness and weight loss may progress to the point where stair climbing is difficult. Cardiovascular disorders, such as atrial fibrillation or congestive heart failure, may occur. Hypothyroidism often has an insidious onset and includes symptoms such as lethargy, constipation, stiffness or cramping of muscles, or carpal tunnel syndrome. Intellectual activity slows, hair loss may occur, and the voice may become hoarse.

Thyroid abnormalities require evaluation, diagnosis, and treatment prior to medical clearance. Stable thyroid levels (Free T4, & TSH) in the normal range should be obtained from two testings conducted at least one month apart. Candidates on thyroid replacement should be asymptomatic and have normal or low TSH levels.

4) ADRENAL DISORDERS

The adrenal glands produce corticosteroids that affect metabolism and sodium-potassium balance in the body, catecholamines that regulate heart rate, blood pressure and sweating, and other body responses. Corticosteroid insufficiency is characterized by fatigability, weakness, anorexia, nausea, vomiting, hypotension, or hypoglycemia. Excess corticosteroids may cause hypertension, glucose intolerance, psychologic conditions and gastrointestinal problems.

Adrenal abnormalities require evaluation, diagnosis, and treatment before medical clearance. No cardiac arrhythmia or hypertension should be present. Sodium and potassium should be in normal range. Candidates with hypoadrenalism should document their ability to perform vigorous physical activity under stress and adverse environmental conditions without weakness or compromised function. Acceptable documentation may include review of current job duties, work attendance records, medical records and recreational activities.

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